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HUNGARY MAKING DOLOMITE CEMENT AND FIREBRICK

Alfred Donath

No deposits of magnesite have as yet been discovered in Hungary. Magnesite is indispensable in both the building and metal-smelting industries, and large sums of money are expended annually to import this raw material. However, Hungary has large quantities of dolomite, and a technique has been developed by which the dolomite is made to yield a suitable magnesium oxide for the manufacture of both floor covering and firebricks. There are large dolomite deposits in the Buda Hills (Cellert, Sas, Harmashatar), in the Bakony and Vertes mountains, and elsewhere.

Because of its high magnesium content, slaked lime produced from dolomite is too thin for the preparation of mortar. It is also difficult and expensive to prepare magnesium compounds from dolomite because of the mineral's lime content. Dolomite can be best utilized when quarried for building blocks, since it is harder and more resistant to cold (3.5-3.9 percent) than limestone, and its residual dust makes a fine polishing and scouring agent.

Floors made of dolomite are elastic, warm, easy to clean, dust-free, and of a pleasing color. Use of roasted domestic dolomite for the preparation of floor coverings also releases considerable quantities of wood for other uses.

The roasted method was evolved by the Epitestudományi Intezet Laboratoriuma (Laboratory of the Institute of the Science of Building) to make the domestic dolomite yield magnesium oxide. The nut-sized dolomite pieces are placed in a tunnel furnace, where they are kept for 2 hours at a temperature of 750°-780° C. During this time, the CO₂, which is bound to the MgCO₃, is liberated and converted into MgO. However, since it requires a temperature of 900° C for disintegration, the CaCO₃ only becomes hot. When the resultant clinkers have been cooled and ground, a limestone filler is left, as well as the magnesite with its active, binding properties. The pressure of this filler eliminates the hitherto necessary step of adding sand to the magnesite mass.

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Dolomite cement prepared by partial roasting has 75 percent of the binding value of pure magnesium oxide, although its magnesite content is lower. The missing 25 percent is made up through the addition of organic materials. This means that 25 percent more dolomite cement must be used to get a floor of a hardness equal to one made from pure magnesite costs 1,400 forints per ton, whereas local dolomite cement costs only 300 forints per ton.

The cost of preparing a ton of dolomite cement is as follows:

	<u>Forints</u>
Raw materials	24
Roasting (300 kg coal, etc.)	100
Grinding	100
Miscellaneous	76
Total	<u>300</u>

If the cost of the 25 percent additional dolomite cement required to achieve pure magnesite hardness is added to this total, the price totals 400 forints per ton.

The tunnel furnace about to be installed at the Leányvár [Esztergom County] plant of the Műve és Kőipari Vállalat (Artificial Stone and Concrete Enterprise) will be capable of producing 3,000 tons of dolomite cement annually. This quantity is sufficient for the preparation of 250,000 square meters of floor covering.

The Budapesti Kényszerítő (Budapest Sulfuric Acid Enterprise) has heretofore prepared the magnesium-chloride solution necessary for binding dolomite cement from imported magnesite dissolved in hydrochloric acid. Now this import can be cut 80-90 percent, since most of the magnesite essential to preparation of the solution can be recovered from used firebricks. Formerly, firebricks covered with slag were discarded. Now, a valuable source of magnesium chloride are the used bricks or brick fragments, which are put through a process evolved by the Budapesti Kényszerítő whereby they are immersed in a solution of hydrochloric acid to which 10-20 percent fresh magnesite has been added to set off the reaction.

Another significant project is the manufacture of completely roasted dolomite firebricks. As a result of the Five-Year Plan, industry's demand for fireproof materials is expected to increase 100 percent, and, consequently, an increase in the exploitation of Hungary's domestic raw materials becomes a vital necessity.

The fundamental aim of the Five-Year Plan is to increase the output of steel, and magnesite bricks are indispensable in steel production. The bottoms, sides, and even the heads of Martin furnaces are built largely of magnesite and chromium-magnesite bricks, since they increase the production capacity of a furnace.

The magnesite kilns established in the Gomor-Szepes Ore Mountains can fill the demand for magnesite sinter. However, production costs for magnesite sinter are very high. The most expedient way of cutting these costs is to substitute bricks of domestic dolomite for magnesite bricks.

The first ventures in Hungary with dolomite brick were not entirely satisfactory, because the bricks absorbed moisture from the air and crumbled through combination with the atmosphere's carbon dioxide. Otherwise, however, they met all the requisites of firebricks intended for use in steel-smelting furnaces.

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Attempts to make the dolomite bricks storable by saturating them with paraffin or tar, or even wrapping them individually in wax paper to shield them from moisture, were only moderately effective. However, scientists discovered that the only way to produce stable dolomite bricks is to neutralize their free lime content so that the CaO cannot eventually turn into CaOH₂ or CaCO₃. This was achieved by combining the calcium in the form of a silicate. Since the most easily arrived at β form of bisilicate is also unstable, a trisilicate structure -- 3CaO, SiO₂, and not 2CaO, SiO₂ -- must be formed to get a completely stable dolomite brick.

The laboratory of the Magnezitipar Vallalat (Magnesite Production Enterprise) conducted research to this end, keeping in mind that, while the new compound would have to make the firebricks storable, it must not destroy their other qualities.

Dolomite quarried at Pilisvorosvar [Pest County] and talc gotten at Felsocsatar [Vas County] were the raw materials used for the experiments. To accelerate the reaction, one percent of P₂O₅ was added as a mineralizing agent; with this combination, a completely stable dolomite brick was produced. The physical properties of the new brick approximate those of magnesite bricks. Its compressibility is about 600 kg/sq cm; density, 2.66 kg/cu decim; absorption, 7.65 percent; melting point, around 1,610° C.

The dolomite bricks, soon to be mass produced, will be built into the rear wall of a Martin furnace at Ozd to test them in actual use.

The manufacture of dolomite bricks corresponds to that of other firebricks, except in the preparation of the stable clinker. The raw dolomite, mixed with talc of the required quality and with the mineralizer, is ground to a fineness of 4,900 mesh in a tube mill, compressed, and roasted at 1,700° C. The resultant stable clinkers are ground and their grist is then put through the customary manufacturing processes.

Bricks manufactured in this manner and boiled in water for a long time remained unchanged, even after being exposed for months to atmospheric conditions. However, even if these dolomite bricks prove successful in actual use, it will be some time before they can be manufactured extensively, since the installations necessary for their manufacture cannot be set up overnight.

Another way in which import of magnesite into Hungary can be reduced is by replacing with dolomite the compressed sinters (generally made from magnesite sinters) set at the base of the steel-smelting furnaces. One of Hungary's steel mills is currently conducting successful experiments with this method.

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